

Claims

1. A method for evaluating polishing pad surface conditions comprising the following steps:
 - removing polishing fluid adhered to a polishing pad surface for at least an area of said polishing pad surface;
 - illuminating with light said area of said polishing pad surface from which said polishing fluid was removed;
 - detecting light reflected from said polishing pad surface due to said illuminating light;
 - evaluating deterioration of said polishing pad surface based on an intensity signal of said detected reflected light; and
 - displaying results from said evaluation on a monitor.
2. A method for evaluating polishing pad surface conditions as described in claim 1 wherein an area of said polishing pad illuminated by said light is moved successively.
3. A method for evaluating polishing pad surface conditions as described in claim 1 wherein removal of polishing fluid adhered to said polishing pad surface is performed by blowing gas onto said polishing pad surface.
4. A method for evaluating polishing pad surface conditions as described in claim 1 further comprising a step for outputting information of said evaluation results to conditioning means for said polishing pad.
5. A method for evaluating polishing pad surface conditions comprising the following steps:
 - removing polishing fluid adhered to a polishing pad surface for at least an area of said polishing pad surface;
 - illuminating with light said area of said polishing pad surface from which said

polishing fluid was removed;

imaging said illuminated area and obtaining an image of said polishing pad surface;

evaluating deterioration of said polishing pad surface based on said surface image; and

displaying results from said evaluation on a monitor.

6. A method for evaluating polishing pad surface conditions as described in claim 5 wherein said image is digitized and said digitized image is used to evaluate deterioration of said polishing pad surface.

7. A method for evaluating polishing pad surface conditions as described in claim 5 wherein bi-level conversion is performed on said image to obtain a bi-level image and an area ratio of said bi-level image is used to evaluate deterioration of said polishing pad surface.

8. A method for evaluating polishing pad surface conditions as described in claim 5 further comprising a step for outputting information of said evaluation results to conditioning means for said polishing pad.

9. A method for evaluating polishing pad surface conditions comprising the following steps:

removing polishing fluid adhered to a polishing pad surface for at least an area of said polishing pad surface;

illuminating with light said area of said polishing pad surface from which said polishing fluid was removed;

detecting fluorescence generated by said polishing pad due to said illumination;

evaluating deterioration of said polishing pad surface based on an intensity signal of said detected fluorescence; and

outputting results from said evaluation.

10. A method for evaluating polishing pad surface conditions as described in claim 7 wherein: a fluorescence generated by said polishing pad is detected and a fluorescence image is obtained; and deterioration due to contaminants on said polishing pad surface is evaluated based on said fluorescence image.

11. A method for evaluating polishing pad surface conditions as described in claim 7 wherein said information of said evaluation results is displayed on a display.

12. A device for evaluating polishing pad surface conditions comprising:

means for removing polishing fluid removing polishing fluid adhered to at least an area of a polishing pad surface;

means for illuminating using light to illuminate said area on said polishing pad surface from which said polishing fluid was removed b said polishing fluid removing means;

means for detecting reflected light detecting light reflected from said polishing pad surface illuminated by said illuminating means;

means for evaluating evaluating deterioration of said polishing pad surface based on an intensity signal of reflected light detected by said reflected light detecting means; and

means for displaying displaying information of results from said evaluation.

13. A device for evaluating polishing pad surface conditions as described in claim 12 wherein: said illuminating means and said polishing means move relative to each other; and an illumination area on said polishing pad from said light moves successively.

14. A device for evaluating polishing pad surface conditions as described in claim 12 wherein said polishing fluid removing means removes polishing fluid adheres to said polishing pad surface by blowing a gas onto said polishing pad surface.

15. A device for evaluating polishing pad surface conditions as described in claim 12 further comprising means for outputting outputting information from said evaluation results to conditioning means for said polishing pad.

16. A device for evaluating polishing pad surface conditions comprising:

means for removing polishing fluid removing polishing fluid adhered to at least an area of a polishing pad surface;

means for illuminating using light to illuminate said area on said polishing pad surface from which said polishing fluid was removed by said polishing fluid removing means;

means for capturing images imaging an area illuminated by said illuminating means and obtaining an image of said polishing pad surface;

means for evaluating evaluating deterioration of said polishing pad surface based on an image of said polishing pad surface obtained through said image capturing means; and

means for outputting outputting information of results from said evaluating means.

17. A device for evaluating polishing pad surface conditions as described in claim 16 wherein said evaluating means digitizes said image obtained through said image capturing means and said digitized image is used to evaluate deterioration of said polishing pad.

18. A device for evaluating polishing pad surface conditions as described in claim 16 wherein: said evaluating means performs bi-level conversion on said image obtained through said image capturing means to provide a bi-level image; and deterioration of said polishing pad surface is evaluated based on an area ratio of said bi-level image.

19. A device for evaluating polishing pad surface conditions as described in claim 16 further

comprising means for outputting outputting information of results from said evaluation to conditioning means for said polishing pad.

20. A device for evaluating polishing pad surface conditions comprising:

means for removing polishing fluid removing polishing fluid adhered to at least an area of a polishing pad surface;

means for illuminating using light to illuminate said area on said polishing pad surface from which said polishing fluid was removed by said polishing fluid removing means;

means for detecting fluorescence detecting fluorescence generated by said polishing pad due to illumination from said illuminating means;

means for evaluating evaluating deterioration of said polishing pad surface based on an intensity signal of fluorescence detected by said fluorescence detecting means; and

means for outputting outputting information of results from said evaluation.

21. A device for evaluating polishing pad surface conditions as described in claim 20 wherein: said fluorescence detecting means detects fluorescence generated by said polishing pad and obtains a fluorescence image; and said evaluating means evaluates deterioration of said polishing pad surface due to contaminants based on a fluorescence image obtained by said fluorescence detecting means.

22. A device for evaluating polishing pad surface conditions as described in claim 20 wherein said outputting means displays information of results evaluated by said evaluating means to a display.

23. A method for producing thin-film devices comprising the following steps:

a step for forming a thin film on a substrate;

a step for planarizing a surface of said substrate by polishing said substrate surface on which said thin film is formed using a polishing pad;

a step for cleaning said planarized substrate; and
a step for applying a resist to said cleaned substrate and exposing a pattern;
wherein, in said planarizing step, light is used to illuminate a surface of said
polishing pad used to polish said substrate surface, light reflected from said polishing pad
due to said illumination is detected, surface deterioration of said polishing pad is evaluated
based on a detection signal from said reflected light, and a surface condition of said
polishing pad is restored based on results from said evaluation.

24. A method for producing thin-film devices as described in claim 23 wherein, in said
planarizing step, an optical image of said polishing pad surface is detected from reflected
light from said polishing pad, and surface deterioration of said polishing pad is evaluated
based on said detected optical image.

25. A method for producing thin-film devices as described in claim 23 wherein, in said
planarizing step, evaluation of deterioration of said polishing pad surface and restoration
of said surface condition of said polishing pad based on said results from said evaluation
are performed while said substrate surface is being polished using said polishing pad.